

10. Main Avenue / Butterfield Boulevard
11. Main Avenue / Condit Road
12. Dunne Avenue / Monterey Road
13. Dunne Avenue / Butterfield Boulevard
14. Dunne Avenue / US 101 Northbound Ramps
15. Tennant Avenue / US 101 Northbound Ramps

The operations of the key intersections were evaluated during the morning (AM) and evening (PM) peak commute periods for the following scenarios:

**Scenario 1:** *Existing Conditions* – Existing volumes obtained from counts.

**Scenario 2:** *Background Conditions* – Existing peak-hour volumes plus traffic from approved but not yet constructed developments in the area.

**Scenario 3:** *Project Conditions* – Background peak-hour traffic volumes plus traffic generated by the proposed retail development.

**Scenario 4:** *Cumulative No Project Conditions* – Existing peak-hour volumes plus traffic generated by approved and pending projects.

**Scenario 5:** *Cumulative Plus Project Conditions* – Cumulative No Project volumes plus traffic generated by the proposed project.

**Scenario 6:** *General Plan 2025 Conditions* – Volumes projected for Year 2025 with the currently approved General Plan plus traffic generated by the proposed project.

Potential project impacts of the adjacent freeway segments of US 101 north and south of Cochrane Road were evaluated as well as site access, on-site circulation, and parking.

The remainder of this report is divided into eight chapters. Chapter 2 presents Existing Conditions in terms of the existing roadway configurations, transit service, bicycle and pedestrian facilities, traffic volumes, and operating conditions of the key intersections. Operations under Background Conditions with traffic from approved but not yet constructed developments are discussed in Chapter 3. Chapter 4 describes the methodology used to estimate the project traffic and its impacts on the transportation system (intersections and freeway segments). This chapter includes a discussion of site access, on-site circulation, and parking. Chapter 5 presents the discussion of an alternative project description. Chapter 6 presents the Cumulative Conditions. Operations of the key intersections under General Plan Buildout Conditions are described in Chapter 7 and Chapter 8 presents the study conclusions and recommendations.

## 2. EXISTING CONDITIONS

This chapter describes the existing conditions of the roadway facilities, traffic volumes, intersection operations, pedestrian and bicycle facilities, and transit service. This chapter also includes a discussion of the methodology used to calculate intersection levels of service and the corresponding results.

### ROADWAY NETWORK

US 101 and Monterey Road provide regional access to the project site. The following streets provide local access to the project site: Cochrane Road, Main Avenue, Dunne Avenue, Tennant Avenue, Butterfield Boulevard, DePaul Drive, Mission View Drive, Half Road, and Condit Road. Descriptions of these roadway facilities are presented below.

*US 101* extends northward through San Jose and San Francisco and southward along the California Central Coast. US 101 is a six-lane freeway (three mixed flow lanes in each direction) between Cochrane Road and Monterey Street in Gilroy. North of Cochrane Road to San Jose, US 101 provides three mixed-flow lanes and one High Occupancy Vehicle (HOV) lane in each direction. The interchange at Cochrane Road provides access to the project site.

*Monterey Road* provides regional access to Gilroy and San Jose and local access within the City of Morgan Hill. North of Cochrane Road, Monterey Road is four-lanes wide. Within Morgan Hill, Monterey Road is a four-lane arterial with on-street parking and left-turn lanes at intersections. Monterey Road narrows to a single southbound lane near the Union Pacific Railroad over-crossing between Cochrane Road and Wright Avenue. Monterey Road features a continuous center lane for left turns from Wright Avenue to Main Avenue and south of Dunne Avenue. The speed limit on Monterey Road is 45 miles per hour (mph) north of Cochrane Road and varies from 25 to 40 mph between Cochrane Road and East Dunne Avenue.

*Cochrane Road* is a four-lane, divided arterial that extends eastward from its intersection with Monterey Road through a partial-cloverleaf interchange at US 101. East of US 101, Cochrane Road is a two-lane road that extends eastward to Anderson Reservoir and then southward to its terminus at the Main Street/Liberata Drive intersection. Existing land uses along Cochrane Road, near the project site, are primarily residential in nature.

*Main Avenue* is a two-lane, arterial roadway that intersects Monterey Road and extends eastward over US 101. East of US 101, Main Avenue becomes a two-lane road that intersects Condit Road and Elm Street. This street links Live Oak High School with Downtown Morgan Hill.

*Dunne Avenue* is a four-lane divided arterial that intersects Monterey Road, Butterfield Boulevard, Condit Road, and Hill Road. Dunne Avenue includes a partial cloverleaf interchange with US 101, and east of US 101, Dunne Avenue becomes a two-lane roadway at Hill Road. The roadway is posted at 35 mph and is signalized at intersections at major cross streets.

*Murphy Avenue* is a north-south roadway that extends between Diana Avenue and Middle Avenue on the east side of US 101. Murphy Avenue currently provides one travel lane in each direction. The City of Morgan Hill's General Plan designates Murphy Avenue as a four-lane arterial that will be extended to the north and connect with DePaul Drive.

*Tennant Road* is a four-lane, divided east-west arterial between Monterey Road and US 101. East of US 101, Tennant Road is a two-lane rural road that extends eastward and intersects Condit Road.

*Butterfield Boulevard* is a four-lane, divided arterial that extends southward from its intersection with Cochrane Road to Tennant Avenue and is a primary corridor through the City. Butterfield Boulevard forms the eastern boundary of downtown Morgan Hill. The roadway is posted at 45 mph and is signalized at intersections with major cross streets.

*DePaul Drive* (formerly known as St Louise Drive) is a two-lane residential street that terminates south of Cochrane Road. The DePaul medial center outpatient build is the primary uses served by this street.

*Mission View Drive* is a two-lane, north-south rural road between Cochrane Road and Half Road.

*Half Road* is a two-lane, east-west rural road between Condit Road and Peet Road. Half Road intersects both Mission View Drive and Elm Road.

*Condit Road* is a two-lane rural road that extends southward from Half Road to Tennant Road.

## EXISTING TRANSIT SERVICE

The Santa Clara Valley Transportation Authority (VTA) operates bus service in Santa Clara County. Commuter rail service (CalTrain) is provided from San Francisco to Gilroy by the Peninsula Joint Powers Authority Board. Figure 3 shows the existing transit facilities near the project site.

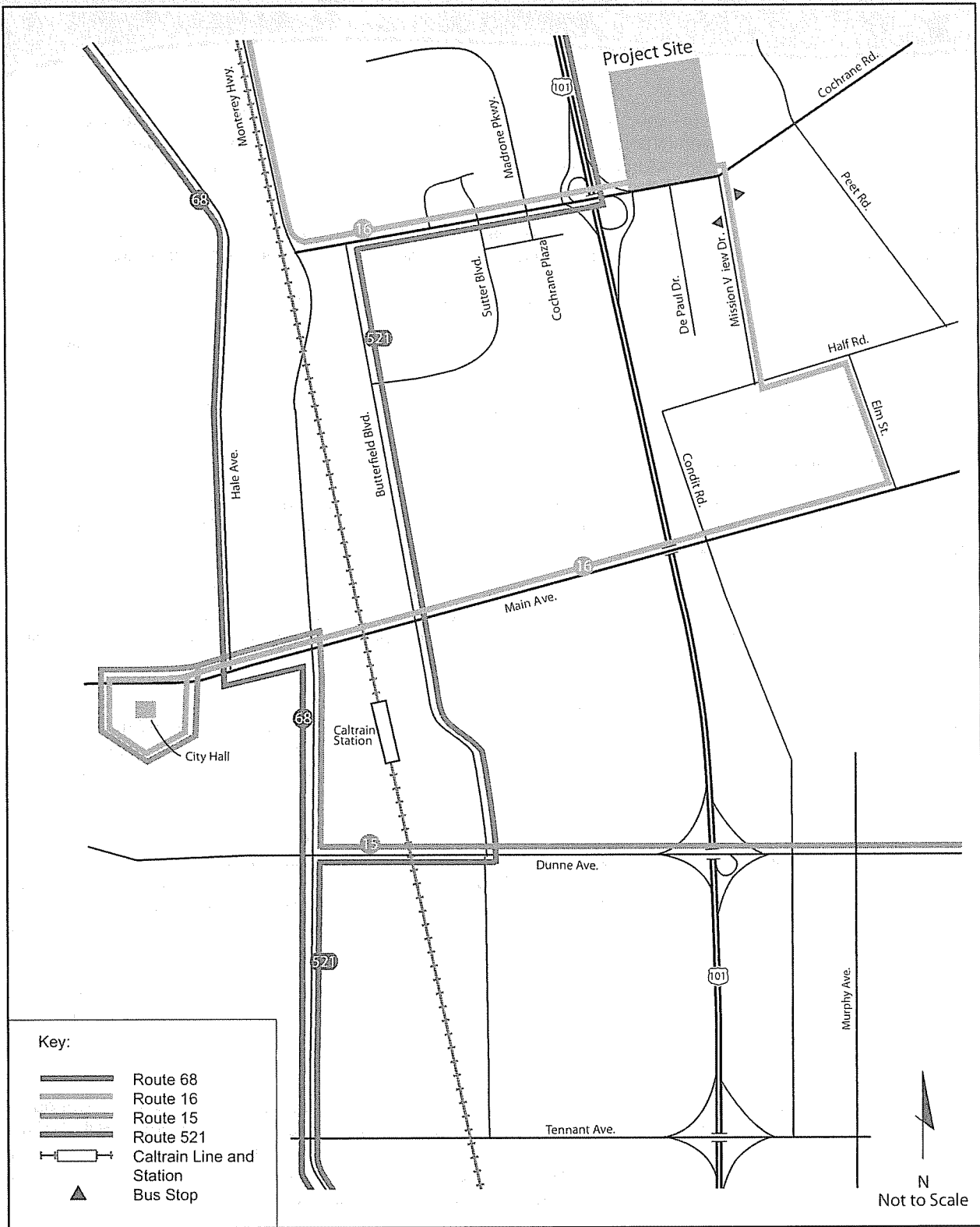
*Local Route 15* provides bus service between Jackson Oaks neighborhood and the Morgan Hill Civic Center from 6:00 am to 9:00 am and 2:00 pm to 6:00 pm on weekdays with 60 minute headways. Route 15 does not operate on weekends. This bus route does not pass near the project site but connects with Route 16 on Main Street near Monterey Road.

*Local Route 16* provides bus service between Burnett Avenue and the Morgan Hill Civic Center from 6:00 am to 6:00 pm on weekdays with 45 to 60 minute headways during the weekday commute and 60 minutes during the midday. Route 16 does not operate on weekends. Near the project site, Route 16 operates along Cochrane Road and Mission View Drive. The closest bus stop is on Mission View Drive near the Cochrane Road intersection.

*Local Route 68* provides bus service between Gilroy/Gavilan College and the Diridon Station in San Jose from 4:00am to 1:15am the following day on weekdays with 15 to 30 minute headways during the commute and midday periods and 60 minute headways after 7:00pm. Route 68 operates on Saturday and Sunday from 5:45 am to 1:15 am the following day with 30 minute headways until 9:00 pm on Saturday and 7:00 pm on Sunday when the headway increases to 60 minutes. This bus route does not provide direct access to the project site but connects with Route 16 on Main Avenue near Monterey Road.

*Express Bus Route 521* provides bus service between the Gilroy CalTrain Station and Moffett Park in Mountain View. Near the project site, Route 521 operates on US 101 and Dunne Avenue, stopping at the CalTrain station. Route 521 operates five northbound buses from 4:30 am to 7:45 am and four southbound buses from 2:45 pm to 6:30 pm.

*CalTrain* provides frequent train service between San Jose and San Francisco seven days a week. During the commute hours, CalTrain provides extended service to Morgan Hill and Gilroy. The Morgan Hill CalTrain Station is located east of Depot Street between First and Second Streets. Direct transit service is not provided between the project site and the CalTrain Station. The station can be accessed via Bus Route 16 to the Main Avenue/Butterfield Boulevard intersection and then walking approximately ¼ mile.



Cochrane Rd PUD

## EXISTING PEDESTRIAN AND BICYCLE FACILITIES

Pedestrian facilities comprise sidewalks, crosswalks, and pedestrian signals. Near the project site, sidewalks are provided on both sides of Cochrane Road across its interchange with US 101. There are additional sidewalks on the south side of Cochrane Road east of Mission View Drive and on the east side of Mission View Road south of Cochrane Road.

Existing bicycle facilities are provided on Cochrane Road west of the US 101 interchange and the southbound ramps. Bicyclists must share the road on Cochrane Road in front of the project site. Figure 4 shows additional bicycle facilities on Main Avenue, Dunne Avenue, Tennant Avenue, Butterfield Boulevard, and Hale Avenue within the greater study area.

## EXISTING INTERSECTION VOLUMES AND LANE CONFIGURATIONS

The operations of the key intersections were evaluated during weekday AM and PM peak-hour traffic conditions and midday peak-hour conditions on Saturday. The AM and PM periods are between 7:00 and 9:00 am and 4:00 and 6:00 pm, respectively. The weekend midday peak-hour period is between 12:00 and 2:00 pm when retail establishments typically generate their highest volumes. Intersection operations were evaluated for the highest one-hour volume counted during each of these periods.

Recent (2004) traffic counts at the intersections along Cochrane Road between Monterey Road and the US 101 Southbound Off-Ramp were obtained from city staff. New traffic counts were conducted at the remaining study intersections during the AM, PM and Saturday midday peak periods in March and November 2004 (see Appendix A).

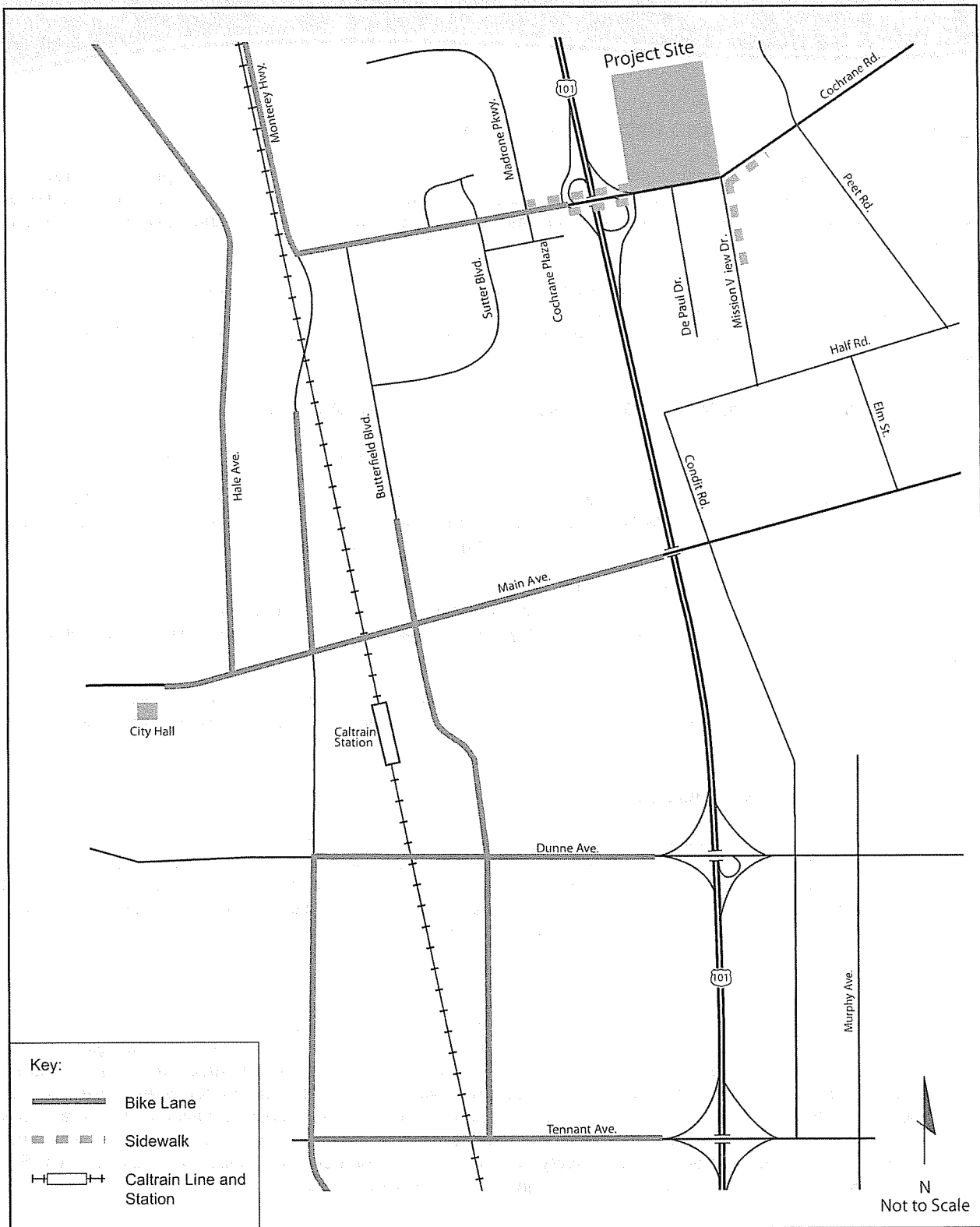
Figures 5a and 5b present the existing AM, PM and Saturday midday peak-hour turning movement volumes at the key intersections. Existing intersection lane configurations and traffic control devices are presented on Figures 6a and 6b.

## LEVEL OF SERVICE METHODOLOGY

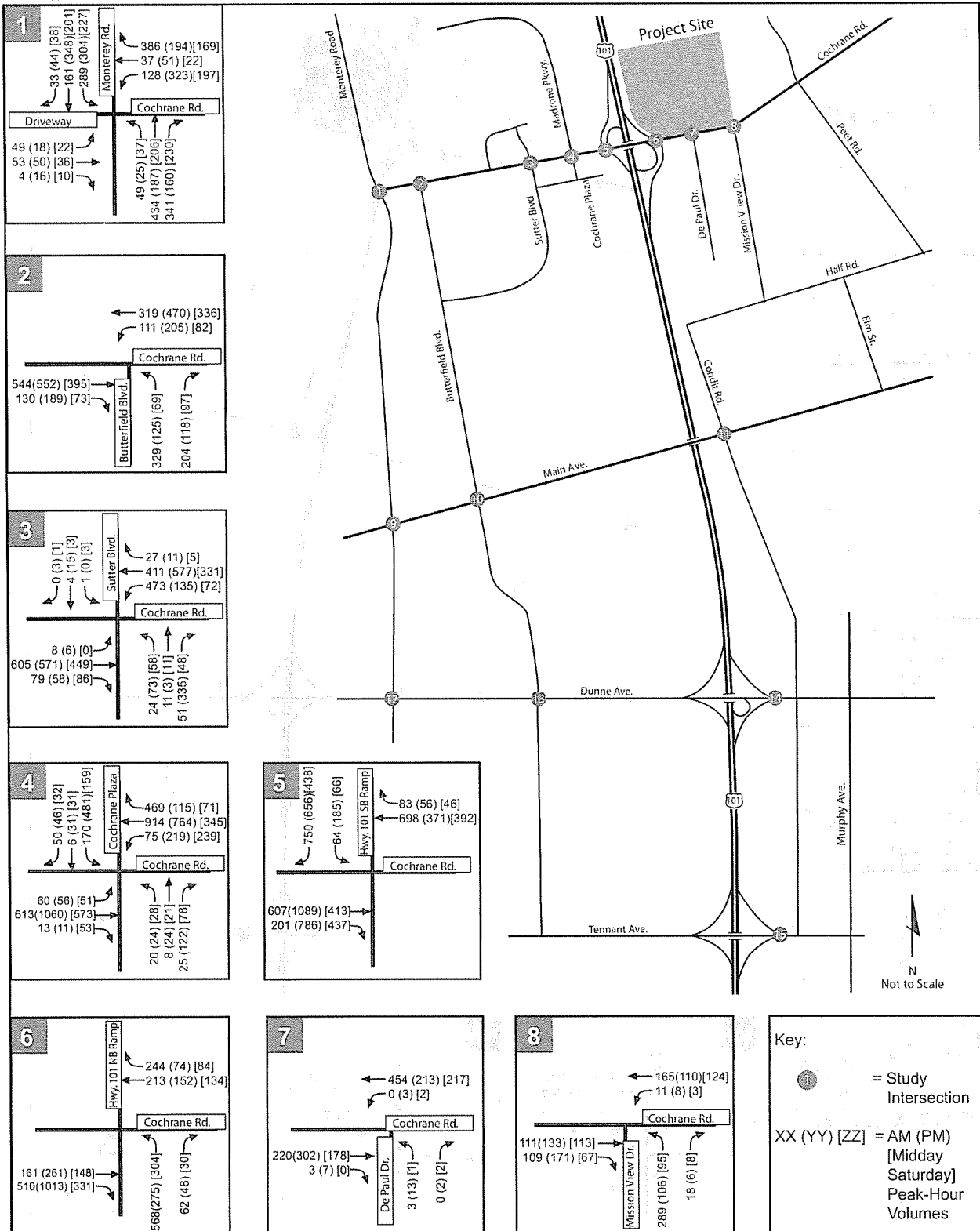
The operations of roadway facilities are described with the term *level of service*. Level of Service (LOS) is a qualitative description of traffic flow based on such factors as speed, travel time, delay, and freedom to maneuver. Six levels are defined from LOS A, as the best operating conditions, to LOS F, or the worst operating conditions. LOS E represents "at-capacity" operations. When volumes exceed capacity, stop-and-go conditions result, and operations are designated as LOS F.

### ***Intersection***

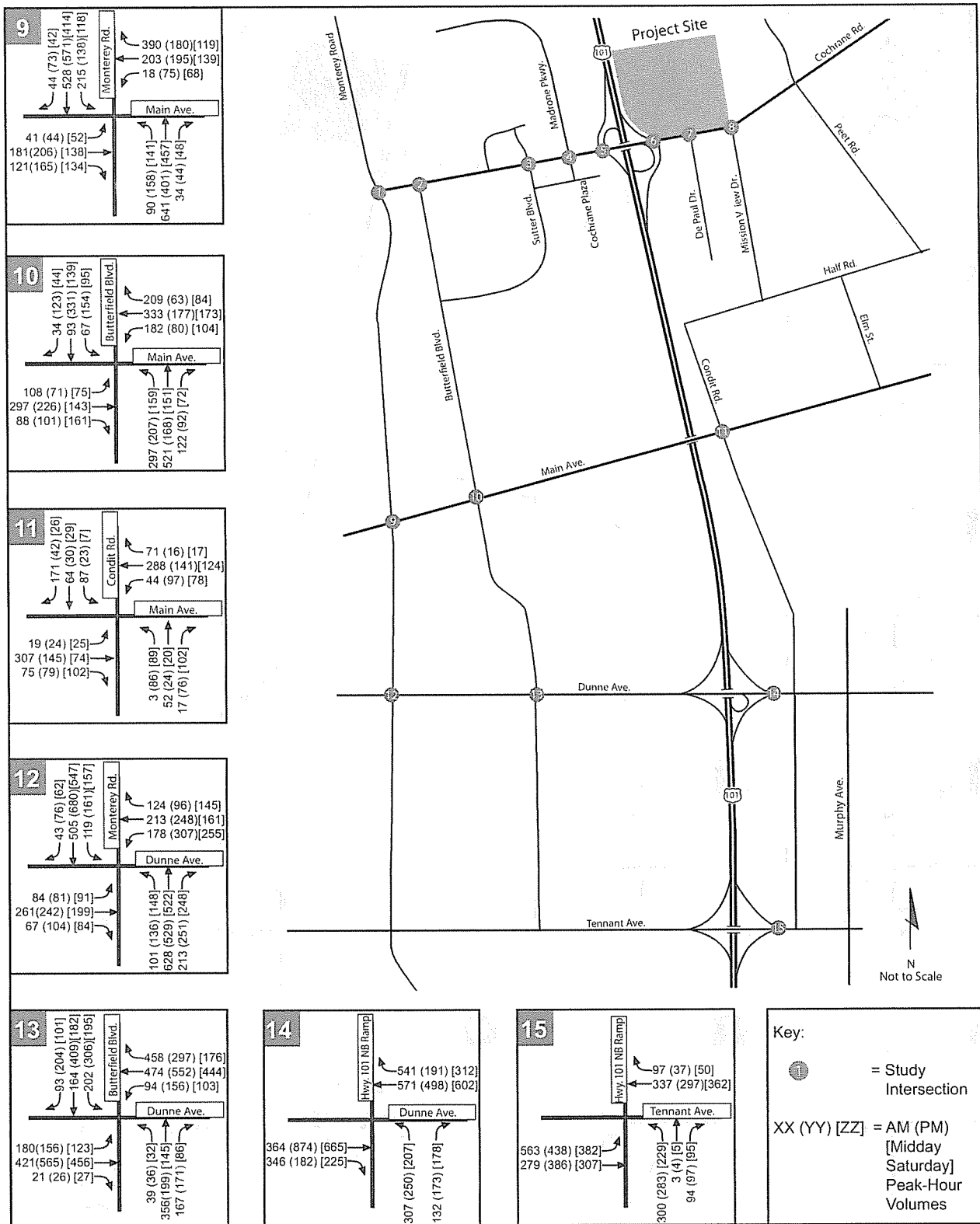
The level of service calculation methodology for intersections is dependent on the type of traffic control device: traffic signals or stop signs. The level of service methodology approved by the City of Morgan Hill and the VTA analyzes a signalized intersection's operation based on average control vehicular delay calculated using the method described in Chapter 16 of the 2000 *Highway Capacity Manual (HCM)* (Special Report 209, Transportation Research Board) with adjusted saturation flow rates to reflect conditions in Santa Clara County. Control delay includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. The average control delay for signalized intersections is calculated using TRAFFIX analysis software and is correlated to a LOS designation as shown in Table 1.



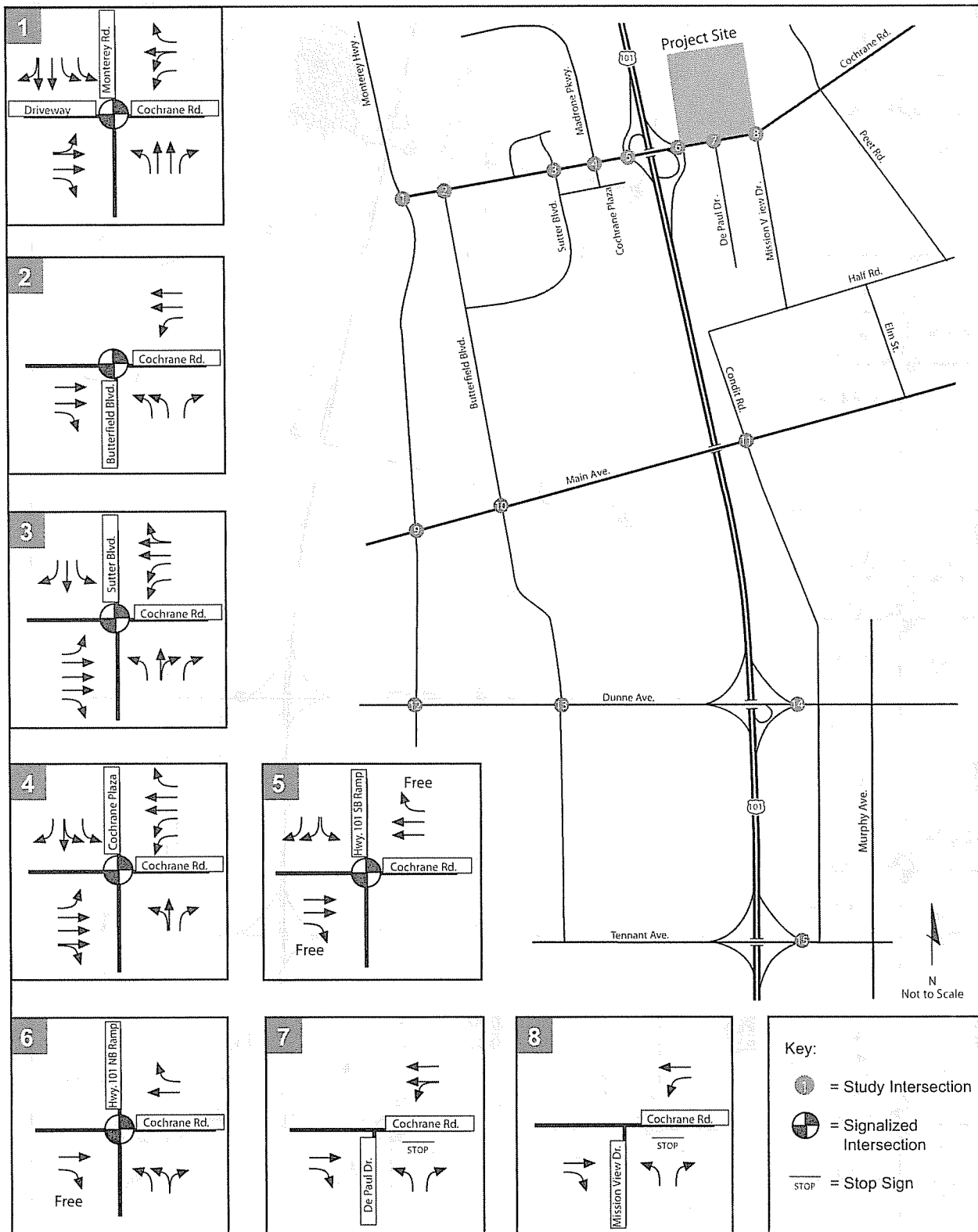
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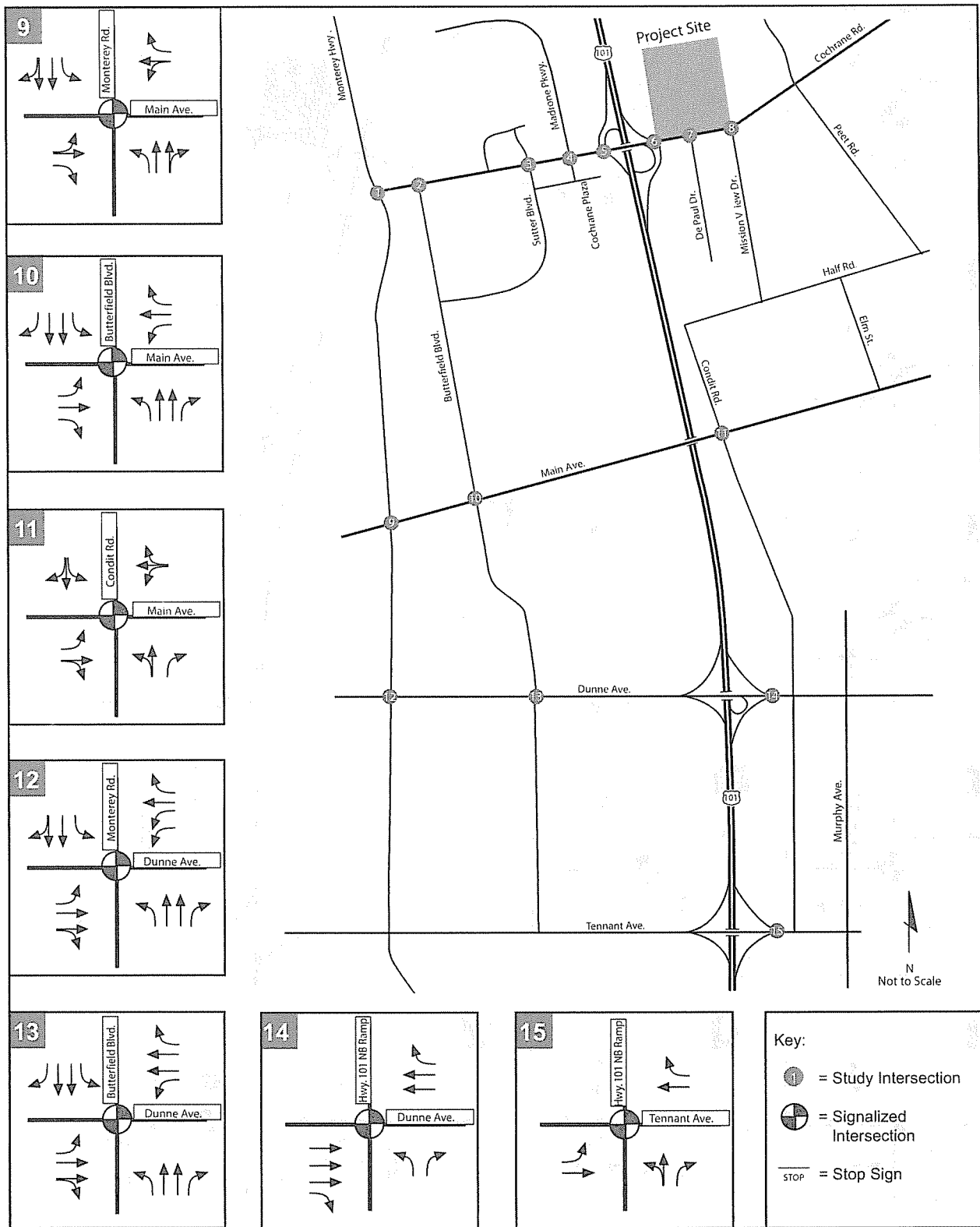
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**TABLE 1**  
**SIGNALIZED INTERSECTION LEVEL OF SERVICE DEFINITIONS**  
**USING AVERAGE CONTROL VEHICULAR DELAY**

Level of Service	Description	Average Control Delay Per Vehicle (Seconds)
A	Operations with very low delay occurring with favorable progression and/or short cycle lengths.	≤ 10.0
B+	Operations with low delay occurring with good progression and/or short cycle lengths.	10.1 to 12.0
B		12.1 to 18.0
B-		18.1 to 20.0
C+	Operations with average delays resulting from fair progression and/or longer cycle lengths. Individual cycle failures begin to appear.	20.1 to 23.0
C		23.1 to 32.0
C-		32.1 to 35.0
D+	Operations with longer delays due to a combination of unfavorable progression, long cycle lengths, and high V/C ratios. Many vehicles stop and individual cycle failures are noticeable.	35.1 to 39.0
D		39.1 to 51.0
D-		51.1 to 55.0
E+	Operations with high delay values indicating poor progression, long cycle lengths, and high V/C ratios. Individual cycle failures are frequent occurrences.	55.1 to 60.0
E		60.1 to 75.0
E-		75.1 to 80.0
F	Operations with delays unacceptable to most drivers occurring due to over-saturation, poor progression, or very long cycle lengths.	> 80.0

Source: VTA's CMP Traffic Level of Service Analysis Guidelines, June 2003, and Transportation Research Board, *Highway Capacity Manual*, 2000.

The City of Morgan Hill has set an operating standard of LOS E at freeway ramp intersections and LOS D+ for all other signalized intersections, except Madrone Parkway/Monterey Road, Tennant Avenue/Butterfield Boulevard, and Watsonville Road/Monterey Road where LOS D is considered acceptable.

Operations of the unsignalized study intersections (Cochrane Road/DePaul Drive and Cochrane Road/Mission View Drive) were evaluated using the methodology contained in Chapter 17 of the *2000 Highway Capacity Manual*. LOS ratings for stop-sign controlled intersections are based on the average control delay expressed in seconds per vehicle. At two-way or side street-controlled intersections, the control delay is calculated for each movement, not for the intersection as a whole. For approaches composed of a single lane, the control delay is computed as the average of all movements in that lane. Table 2 summarizes the relationship between delay and LOS for unsignalized intersections. LOS D+ is the minimum acceptable level of service for unsignalized intersections.

**TABLE 2**  
**UNSIGNALIZED INTERSECTION LEVEL OF SERVICE**  
**DEFINITIONS USING AVERAGE CONTROL DELAY**

Level of Service	Description	Average Control Delay Per Vehicle (Seconds)
A	Little or no delay	≤ 10.0
B	Short Traffic delays	10.1 to 15.0
C	Average traffic delays	15.1 to 25.0
D	Long traffic delays	25.1 to 35.0
E	Very long traffic delays	35.1 to 50.0
F	Extreme traffic delays with intersection capacity exceeded	> 50.0

Source: 2000 Highway Capacity Manual, Transportation Research Board.

### Freeway Segment

Freeway segments were evaluated using VTA's analysis procedure, which is based on the density of the traffic flow using methods described in the 2000 Highway Capacity Manual. Density is expressed in passenger cars per mile per lane. The Congestion Management Program range of densities for freeway segment level of service is shown in Table 3. These ranges are based on the 2000 HCM level of service threshold with adjustments to reflect local (Santa Clara County) conditions.

**TABLE 3**  
**DENSITY-BASED FREEWAY LEVEL OF SERVICE**

Level of Service	Density (vehicles/mile/lane)
A	≤ 11
B	11.0 to 18.0
C	18.1 to 26.0
D	26.1 to 46.0
E	46.1 to 58.0
F	> 58.0

Source: VTA's CMP Traffic Level of Service Analysis Guidelines, June 2003.

### EXISTING INTERSECTION LEVELS OF SERVICE

Existing intersection lane configurations and peak-hour turning movement volumes were used to calculate the levels of service for the key intersections during each peak hour. The results of the LOS analysis for Existing Conditions are presented in Table 4. The corresponding calculation sheets are in Appendix B.

**TABLE 4  
EXISTING INTERSECTION LEVELS OF SERVICE**

Intersection	Peak Hour <sup>1</sup>	Count Date	Intersection Control	Delay <sup>2</sup>	LOS <sup>3</sup>
1. Cochrane Road/Monterey Road	AM	5/04	Signal	20.2	C+
	PM	6/04		25.0	C
	SAT	11/04		23.5	C
2. Cochrane Road/Butterfield Boulevard	AM	5/04	Signal	12.8	B
	PM	5/04		11.8	B+
	SAT	11/04		10.0	A
3. Cochrane Road/Sutter Boulevard	AM	11/04	Signal	20.4	C+
	PM	7/04		15.2	B
	SAT	7/04		13.6	B
4. Cochrane Road/Cochrane Plaza	AM	11/04	Signal	18.6	B-
	PM	7/04		30.5	C
	SAT	7/04		22.8	C+
5. Cochrane Road/Southbound US 101 Ramp	AM	11/04	Signal	13.0	B
	PM	7/04		13.5	B
	SAT	7/04		19.0	B-
6. Cochrane Road/Northbound US 101 Ramp	AM	11/04	Signal	10.6	B+
	PM	11/04		10.5	B+
	SAT	11/04		10.2	B+
7. Cochrane Road/DePaul Drive	AM	11/04	Stop Sign	11.3	B
	PM	11/04		11.2	B
	SAT	11/04		10.1	B
8. Cochrane Road/Mission View Drive	AM	11/04	Stop Sign	13.9	B
	PM	11/04		10.8	B
	SAT	11/04		10.5	B
9. Main Avenue/Monterey Road	AM	3/04	Signal	27.4	C
	PM	3/04		24.0	C
	SAT	11/04		21.8	C+
10. Main Avenue/Butterfield Boulevard	AM	3/04	Signal	37.3	D+
	PM	3/04		36.9	D+
	SAT	11/04		31.5	C
11. Main Avenue/Condit Road	AM	11/04	Signal	12.3	B
	PM	11/04		9.7	A
	SAT	11/04		9.9	A
12. Dunne Avenue/Monterey Road	AM	3/04	Signal	36.9	D+
	PM	3/04		38.7	D+
	SAT	11/04		30.3	C
13. Dunne Avenue/Butterfield Boulevard	AM	3/04	Signal	33.4	C-
	PM	3/04		35.9	D+
	SAT	11/04		29.7	C
14. Dunne Avenue/ Northbound US 101 Ramp	AM	11/04	Signal	15.2	B
	PM	11/04		12.8	B
	SAT	11/04		9.7	A
15. Tennant Avenue/Northbound US 101 Ramp	AM	11/04	Signal	25.1	C
	PM	11/04		21.7	C+
	SAT	11/04		19.6	B-

**Notes:**

<sup>1</sup> AM = Morning peak-hour, PM = Evening peak-hour, SAT = Saturday midday peak-hour.

<sup>2</sup> Whole intersection weighted average control delay expressed in seconds per vehicle for signalized intersections using methodology described in the 2000 *Highway Capacity Manual*, with adjusted saturation flow rates to reflect Santa Clara County Conditions. For two-way stop controlled unsignalized intersections, total control delay for the worst movement/approach, expressed in seconds per vehicle, is presented. Calculations conducted using the TRAFFIX level of service analysis software package.

<sup>3</sup> LOS = Level of service

The results of the LOS calculations indicate that all study intersections currently operate at acceptable levels of service (LOS D+ or better).

## EXISTING FREEWAY SEGMENT LEVELS OF SERVICE

Table 5 presents the existing AM and PM peak-hour freeway segment levels of service based on the segment densities reported in the CMP's 2004 *Monitoring and Conformance Report*. Based on the monitored freeway segment densities, the northbound segment of US 101 from Tennant Avenue to Dunne Avenue is operating at an unacceptable level of service (LOS F) during the AM peak hour. The remaining freeway segments are operating at LOS E or better during the AM and PM peak hours. The Saturday midday peak hour, which is the peak day for project trip generation, was not monitored as part of the VTA report.

TABLE 5									
EXISTING FREEWAY SEGMENT LEVELS OF SERVICES									
Direction	From/To	From/To	Peak Hour	Number of Lanes		Density		LOS	
				Mixed	HOV	Mixed	HOV	Mixed	HOV
NB US 101	San Martin	Tennant	AM	3	0	48	N/A	E	N/A
			PM	3	0	14	N/A	B	N/A
NB US 101	Tennant	Dunne	AM	3	0	79	N/A	F	N/A
			PM	3	0	18	N/A	B	N/A
NB US 101	Dunne	Cochrane	AM	3	0	45	N/A	D	N/A
			PM	3	0	21	N/A	C	N/A
NB US 101	Cochrane	Burnett	AM	3	0	32	N/A	D	N/A
			PM	3	0	28	N/A	D	N/A
SB US 101	Tennant	San Martin	AM	3	0	12	N/A	B	N/A
			PM	3	0	22	N/A	C	N/A
SB US 101	Dunne	Tennant	AM	3	0	14	N/A	B	N/A
			PM	3	0	30	N/A	D	N/A
SB US 101	Cochrane	Dunne	AM	3	0	18	N/A	B	N/A
			PM	3	0	34	N/A	D	N/A
SB US 101	Burnett	Cochrane	AM	3	0	16	N/A	B	N/A
			PM	3	0	32	N/A	D	N/A
Notes:									
<sup>1</sup> Density based on volume from VTA 2002 CMP Monitoring Data (June 2003) .									
<sup>2</sup> NB=Northbound; SB=Southbound									

The CMP guidelines require the analysis of freeway segments during the AM and PM peak hours, but not the Saturday peak hour, when the peak trip generation for the project occurs. To determine if additional analysis was necessary, weekday and weekend traffic volumes were obtained from Caltrans for comparison purposes. The results show that

weekend peak hour volumes are approximately 25% less than the weekday peak hour on US 101 in the vicinity of the project site. Therefore, an analysis of the freeway segments was not conducted for the Saturday peak hour.

## **FIELD OBSERVATIONS**

Field observations of the study intersections were conducted during the morning, evening, and Saturday midday peak hours in November 2004. The intersections were generally observed to be operating at the calculated levels of service during all three peak hours. No significant congestion was noted and most vehicles cleared the intersections within one signal cycle.

During the AM peak hour, the general pattern of travel is in the northbound direction on the north-south roadways. The intersection of Monterey Road and Main Avenue had vehicle queues in the northbound, southbound, and eastbound left-turn lanes that usually extended the length of the storage pocket. Vehicles typically cleared in one cycle length and queues did not block through traffic. Vehicles in the eastbound and westbound left-turn lanes were observed to queue the length of the pocket at the Butterfield Boulevard/Main Avenue intersection.

During the PM peak hour, Cochrane Road was congested and in some cases through vehicles were queued in the westbound direction and blocked access to left-turn pockets at Cochrane Road/Sutter Boulevard, and Cochrane Road/Madrone Parkway. Southbound through vehicles at the Butterfield Boulevard/Dunne Avenue intersection formed queues, but vehicles typically cleared after one cycle.

Saturday midday peak hour observations indicated overall lower volumes on the roadways with less congestion than both the AM and PM peak hours. It was also noted that there was less directional traffic with a more even distribution of vehicles on the study roadways.

The study freeway segments were also observed to operate with no substantial congestion. Vehicles on the freeway on- and off-ramps were not observed to queue back onto the mainline segments of the freeway.

### 3. BACKGROUND CONDITIONS

This chapter discusses the operations of the key intersections under Background Conditions. Background Conditions are defined as conditions prior to completion of the proposed development and serve as the basis to identify project impacts. Traffic volumes for Background Conditions comprise existing volumes plus traffic generated by approved developments in the area. The results of the level of service analysis for Background Conditions are presented in this chapter.

#### BACKGROUND TRAFFIC ESTIMATES

Traffic volumes for Background Conditions were estimated by adding existing volumes and traffic generated by approved but not yet constructed and occupied developments in the study area.

The list of approved projects, presented in Appendix C, was developed with input from City of Morgan Hill Planning staff. The traffic from the approved developments was obtained from traffic impact reports prepared for each development, or estimated with ITE trip generation rates and standard engineering practice. The trips associated with each development were then assigned to the roadway network based on the relative locations of complementary land uses and existing and estimated future travel patterns. Figure 7 illustrates the traffic volumes at the key intersections under Background Conditions.

#### BACKGROUND INTERSECTION LEVELS OF SERVICE

Intersection level of service calculations were conducted to evaluate the operating levels of the key intersections under Background Conditions. The results of the intersection level of service analysis for the key intersections are presented in Table 6. Appendix B contains the corresponding LOS calculation sheets.

The intersection of Dunne Avenue and Monterey Road is projected to degrade to LOS D, an unacceptable level, during the PM peak hour under Background Conditions. The remaining intersections are projected to operate at acceptable levels (LOS D+ or better for non-freeway and LOS E for freeway intersections) during each peak hour period.